

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

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| TITLE (PROVISIONAL) | Loneliness among older adults in the community during COVID-19: a cross-sectional survey in Canada |
| AUTHORS | Savage, Rachel; Wu, Wei; Li, Joyce; Lawson, Andrea; Bronskill, Susan; Chamberlain, Stephanie; Grieve, Jim; Gruneir, Andrea; Reppas-Rindlisbacher, Christina; Stall, Nathan; Rochon, Paula |

VERSION 1 – REVIEW

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| REVIEWER | James Lubben Boston College USA |
| REVIEW RETURNED | 09-Oct-2020 |

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| GENERAL COMMENTS | <p>The study draws from a large non-representative convenience sample and employs straightforward statistical techniques focusing on gender differences regarding loneliness and responses to COVID-19. The survey was conducted online. The primary dependent variable was loneliness as defined by self-report of feeling lonely at least once during the previous 7 day period. Given the analytic techniques employed it is assumed that it was scored as a dichotomous variable. The primary findings are that living alone and being female increased the odds of loneliness.</p> <p>I recommend rejection in part because the analyses of the data potentially could have generated a richer set of outcomes than that reported. Furthermore the authors should note the following consensus report that was published earlier this year:</p> <p>National Academies of Sciences, Engineering, and Medicine. 2020. Social Isolation and Loneliness in Older Adults: Opportunities for the Health Care System. Washington, DC: The National Academies Press. https://doi.org/10.17226/25663.</p> <p>Here is a link to where they can secure a free pdf of the NASEM report:</p> <p>https://www.nap.edu/catalog/25663/social-isolation-and-loneliness-in-older-adults-opportunities-for-the</p> <p>My general impression is that as presented the current manuscript does not have enough substance to warrant publication at this time.</p> |
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| REVIEWER | Sonny Patel Harvard T.H. Chan School of Public Health, USA |
| REVIEW RETURNED | 14-Oct-2020 |

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| <p>GENERAL COMMENTS</p> | <p>The authors of this paper carried out a cross-sectional study examining loneliness among older retired teachers in a community in Canada during COVID-19 pandemic. With 4879 respondents, the authors used an electronic survey that collected results on self-reported loneliness, sociodemographic characteristics, technology and social connectedness, supporting older adults, and other COVID-19 questions on daily life, concerns and caring for self and others. The paper is written in the standard of written English acceptable for publication, but I would like the authors and editors to consider the following points with possible minor revision to occur before publication:</p> <p> </p> <p>1) I would recommend a minor revision where the authors elaborate about the outcome measure as described on pg 9 lines 13 to 18 to include how it was adapted from the cited sources (2, 24). Was there cognitive interviews or small pilot test of survey wording from stakeholders of RTOERO? For example, cited source 24 (UK Office for National Statistics) specifically recommend to either use the UCLA three-item loneliness scale or the directly worded one-question: "How often do you feel lonely?; Often/always, Some of the time, Occasionally, Hardly ever, Never." Was the latter adapted to form the one-question loneliness question included into the survey? Alternatively, I would advise to include a possible limitation about measuring loneliness since the specific question has not been previously validated to determine that feeling lonely on 1 or more days reflect to the dimension of loneliness which previous research have shown and understood. As cited source 24 stated, measurements and its approaches can confuse loneliness with social isolation (former is on the subjective emotional experience of loneliness and latter is the objective experience of how often we are alone). It is important that this one-question aimed at loneliness in this survey is interpreted by participants as a dimension of loneliness and not social isolation caused by COVID-19 pandemic.</p> <p>2) Additionally, more recent work has been done in this space of loneliness due to lockdown in the elderly communities. It may be useful for a small revision into this paper to include the following references about elderly communities which could strengthen the introduction and discussion sections about loneliness during COVID-19 pandemic (especially on pg. 14 lines 3 to 26 when discussing digital technologies and platforms):</p> <p>a) Campaign to End Loneliness – Psychology of Loneliness - https://www.campaigntoendloneliness.org/wp-content/uploads/Psychology_of_Loneliness_FINAL_REPORT.pdf</p> <p>b) Conroy, K.M., Krishnan, S et al. (2020). Technological advancements to address elderly loneliness: Practical considerations and community resilience implications for COVID-19 pandemic. Working With Older People: https://www.emerald.com/insight/content/doi/10.1108/WWOP-07-2020-0036/full/html</p> <p>c) It may also be useful to include possible implications with latest efforts by big technology companies as it relates to the COVID-19</p> |
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| | <p>pandemic (ie exposure notification express). This could help to connect and strengthen the survey findings on technology and social connectedness into the discussion section and sharpening the future research recommendations that are needed to better understand and combat loneliness during COVID-19 with digital technology. For example, the latest releases by Apple and Google have COVID-19 tracking software embedded into the Apple iOS and Android system (using Bluetooth technology to alert users about COVID-19 positive people near them). Several news outlets have released information about the exposure notification express last month and it could help tie in the discussion of the survey findings about technology apps and devices used during the pandemic. Here is VOX article in case need a news primer about it: https://www.vox.com/recode/2020/9/1/21410291/apple-google-exposure-notification-express-coronavirus-covid-contact-tracing. Also, if need specific digital technology tools, Conroy et al (2020) include names and past research references of tools that can help the authors to strengthen this discussion about technology and social connectedness.</p> <p> </p> <p>3) This paper would require specialist statistical review.</p> |
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| REVIEWER | Martina Luchetti Florida State University, United States |
| REVIEW RETURNED | 25-Nov-2020 |

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| GENERAL COMMENTS | <p>The authors conducted a cross-sectional survey to evaluate loneliness among Canadian older adults during the COVID-19 pandemic. The survey also evaluates factors that may intensify feeling of loneliness during this time.</p> <p>Following, my recommendations:</p> <p>1. The introduction could be improved integrating more research on loneliness, in general, and loneliness during the COVID-19 pandemic, in particular.</p> <p>a. For example, the statement “Older adults are particularly susceptible to loneliness because of aging-related events (e.g. retirement, declining health, widowhood)” it is only partially true. In fact, loneliness is common at every age, and it is not confined to old age. Many recent studies actually suggest that level of loneliness is higher among young adults prevalence rates are highest among young adults (30 years; Hammond, Qualter, Victor, & Barretto, 2018; Luhmann & Hawkley, 2016). Some identified a complex non-linear trajectory across ages, with elevated loneliness levels among young adults and among the oldest old (Luhmann & Hawkley, 2016). Yet, some event in older adulthood might be associated with increase of loneliness (as specified by the authors). This “conflicting” findings should be integrated in the introduction or acknowledged in the discussion. The same is true for differences across genders (see Barreto et al. 2020).</p> <p>b. There is also a growing literature on loneliness and other mental health outcomes that is not discussed in the introduction. The authors simply state “Previous infectious disease outbreaks and pandemics have demonstrated increases in loneliness, anxiety, and depression from quarantine-induced social”. I suggest to update the literature review. Below, I list some of the work that</p> |
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| | <p>have been conducted in the past months, in addition to the few cited by the authors in the discussion.</p> <p>o Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. <i>Journal of Adolescent Health</i>, 67(5), 714-717.</p> <p>o O'Connor, R. C., Wetherall, K., Cleare, S., McClelland, H., Melson, A. J., Niedźwiedź, C. L., ... & Watson, B. (2020). Mental health and wellbeing during the COVID-19 pandemic: longitudinal analyses of adults in the UK COVID-19 Mental Health & Wellbeing study. <i>The British Journal of Psychiatry</i>, 1-17.</p> <p>o Tull, M. T., Edmonds, K. A., Scamaldo, K. M., Richmond, J. R., Rose, J. P., & Gratz, K. L. (2020). Psychological outcomes associated with stay-at-home orders and the perceived impact of COVID-19 on daily life. <i>Psychiatry Research</i>, 289, Article 113098. https://doi.org/10.1016/j.psychres.2020.113098</p> <p>o Losada-Baltar, A., Jiménez-Gonzalo, L., Gallego-Alberto, L., Pedroso-Chaparro, M., del, S., Fernandes-Pires, J., & Márquez-González, M. (2020). "We are staying at home": Association of self-perceptions of aging, personal and family resources, and loneliness with psychological distress during the lock-down period of COVID-19. <i>The Journals of Gerontology: Series B</i>. Advance online publication. https://doi.org/10.1093/geronb/gbaa048</p> <p>o Buecker, S., Horstmann, K. T., Krasko, J., Kritzer, S., Terwiel, S., Kaiser, T., & Luhmann, M. (2020). Changes in daily loneliness during the first four weeks of the Covid-19 lockdown in Germany. https://doi.org/10.31234/osf.io/ytkx9</p> <p>c. Rather than stressing on age/gender, in the introduction I would suggest to stress more aspects like living alone and COVID-19 related factors: practice of physical distancing, history of COVID-19 symptoms, and use of digital technologies. These are all novel aspects that add to extant studies on loneliness during COVID-19. They merit more attention.</p> <p>d. Move the hypothesis/research questions (reported in the method) at the end of the introduction.</p> <p>2. Methods are described appropriately. In terms of analysis, I suggest to report as main analysis the pooled analysis for the all sample, and then follow up with analysis divided by sex (even if I do not see the stratified analysis as useful). Because of possible differences in loneliness between young-older adults and oldest-old (Luhmann & Hawkey, 2016), it will be interesting to evaluate an interaction between age (young-old older adults) and the covariates, particularly COVID-19 related factors (i.e. use of technology). Please consider to add this analysis in the paper.</p> <p>3. One of the main limitations of the study is the cross-sectional design. This aspect should be mentioned in the bullet point list of strengths and limitations. It is unknown whether factors such as use of technology could affect trajectory of loneliness during the development of the current situation.</p> <p>4. In the discussion, I think it is relevant to connect the data from May to the current situation. We are currently dealing with the "second wave" of infection from coronavirus, and we do not have an idea what will be the impact of protracted social distancing, especially among possible vulnerable groups to loneliness. The</p> |
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| | <p>authors should note this aspect in addition to the necessity for further longitudinal assessment.</p> <p>Minors: P. 9, add "Outcome: Loneliness"</p> |
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Comments to the Author

The study draws from a large non-representative convenience sample and employs straightforward statistical techniques focusing on gender differences regarding loneliness and responses to COVID-19. The survey was conducted online. The primary dependent variable was loneliness as defined by self-report of feeling lonely at least once during the previous 7 day period. Given the analytic techniques employed it is assumed that it was scored as a dichotomous variable. The primary findings are that living alone and being female increased the odds of loneliness.

Response: Yes, we dichotomised the loneliness variable for the modelling analysis. Respondents were classified as lonely if they reported feeling lonely on 1 or more days in the preceding 7 days, and not lonely if they reported they had not felt lonely at all in the preceding 7 days. We have added more detail under the 'Outcome' subheading in the methods section to make this clearer.

I recommend rejection in part because the analyses of the data potentially could have generated a richer set of outcomes than that reported. Furthermore the authors should note the following consensus report that was published earlier this year:

National Academies of Sciences, Engineering, and Medicine. 2020. Social Isolation and Loneliness in Older Adults: Opportunities for the Health Care System. Washington, DC: The National Academies Press.

<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdoi.org%2F10.17226%2F25663&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C1%7C637424385267610829%7CUnknown%7CTWFPbGZsb3d8eyJWIjoic4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6Ikk1haWwiLCJXVCi6Mn0%3D%7C1000&sdata=M2HnFzeYr0m%2FyhGvIMk1Pq%2BOKyqm35KRckdImQ4ZHWU%3D&reserved=0>.

Here is a link to where they can secure a free pdf of the NASEM report:

<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.nap.edu%2Fcatalog%2F25663%2Fsocial-isolation-and-loneliness-in-older-adults-opportunities-for-the&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C1%7C637424385267620819%7CUnknown%7CTWFPbGZsb3d8eyJWIjoic4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6Ikk1haWwiLCJXVCi6Mn0%3D%7C1000&sdata=7el1DvFB0YRX%2FiJG2WeYQq9NfuQvBlz8OrXz4MbgluM%3D&reserved=0>

Response: Thank you for the suggestion. We have now cited this report in both our introduction and our discussion.

My general impression is that as presented the current manuscript does not have enough substance to warrant publication at this time.

Reviewer: 2
Reviewer Name
Sonny Patel
Institution and Country
Harvard T.H. Chan School of Public Health, USA
Please state any competing interests or state 'None declared':
None

Comments to the Author

The authors of this paper carried out a cross-sectional study examining loneliness among older retired teachers in a community in Canada during COVID-19 pandemic. With 4879 respondents, the authors used an electronic survey that collected results on self-reported loneliness, sociodemographic characteristics, technology and social connectedness, supporting older adults, and other COVID-19 questions on daily life, concerns and caring for self and others. The paper is written in the standard of written English acceptable for publication, but I would like the authors and editors to consider the following points with possible minor revision to occur before publication:

1) I would recommend a minor revision where the authors elaborate about the outcome measure as described on pg 9 lines 13 to 18 to include how it was adapted from the cited sources (2, 24). Was there cognitive interviews or small pilot test of survey wording from stakeholders of RTOERO? For example, cited source 24 (UK Office for National Statistics) specifically recommend to either use the UCLA three-item loneliness scale or the directly worded one-question: "How often do you feel lonely?; Often/always, Some of the time, Occasionally, Hardly ever, Never." Was the latter adapted to form the one-question loneliness question included into the survey? Alternatively, I would advise to include a possible limitation about measuring loneliness since the specific question has not been previously validated to determine that feeling lonely on 1 or more days reflect to the dimension of loneliness which previous research have shown and understood. As cited source 24 stated, measurements and its approaches can confuse loneliness with social isolation (former is on the subjective emotional experience of loneliness and latter is the objective experience of how often we are alone). It is important that this one-question aimed at loneliness in this survey is interpreted by participants as a dimension of loneliness and not social isolation caused by COVID-19 pandemic.

Response: Thank you for this comment. No, we did not perform cognitive interviews, but we did pre-test the survey, including the same question we used to assess loneliness, with a sample of RTOERO members and staff (n=19). The question was reported to be understood and clear as it was phrased, and there were no indications of confusion based on their responses.

We chose to adapt the UK Office for National Statistics & CLSA question because we wanted a direct measure of loneliness but also wanted to ensure we anchored their response to a period during the pandemic stay-at-home measures (i.e. in the past week), not generally-speaking. We had concerns with the 3-item Loneliness Scale, as we described in our paper, as one of the questions asks how often you feel left out, which we felt could be less specific during the pandemic context given the universally applied distancing and stay-at-home measures. We have revised this section of the methods as follows:

"We used a single-item, direct measure of loneliness by asking respondents "In the past seven days, which statement best applies?" (I did not feel lonely; I felt lonely one or two days; I felt lonely several days; I felt lonely most days; I felt lonely every day). This approach was adapted from the *Canadian Longitudinal Study on Aging* (CLSA)² and the UK's *Community Life Survey*³¹ which measure loneliness by directly asking "How often do you feel lonely?" (often/always, some of the time, occasionally, hardly ever or never). We chose this approach because it allowed respondents to self-report on loneliness, anchored their response to a time during the pandemic stay-at-home measures, and was considered more suitable for the pandemic context, where asking indirectly about feeling "left out" to infer loneliness may be less relevant as distancing and stay-at-home measures were universally applied."

We have also included in our limitations section that our question was not validated but that our findings support its criterion validity.

Regarding your last point, yes, we agree that loneliness and social isolation are different concepts that require different approaches to measurement, as described in reference 24. However, the direct measure of loneliness from the UK Office of National Statistics that we adapted measures loneliness, not social isolation. It explicitly asks (as does our adapted question) whether the respondent felt lonely and how often. Given this emphasis on a subjective feeling, and our pre-testing with older adult members of the RTO, we are confident that our survey respondents interpreted this question to mean their subjective experience of loneliness, not the objective experience of how often they were physically alone. The latter would be measured by asking about social relationships (incl. network size), frequency of communication with this network and social participation.

2) Additionally, more recent work has been done in this space of loneliness due to lockdown in the elderly communities. It may be useful for a small revision into this paper to include the following references about elderly communities which could strengthen the introduction and discussion sections about loneliness during COVID-19 pandemic (especially on pg. 14 lines 3 to 26 when discussing digital technologies and platforms):

a) Campaign to End Loneliness – Psychology of Loneliness -

https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.campaigntoendloneliness.org%2Fwp-content%2Fuploads%2FPsychology_of_Loneliness_FINAL_REPORT.pdf&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C1%7C637424385267620819%7CUnknown%7CTWFpbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IklhaWwiLCJXVCi6Mn0%3D%7C1000&data=wjsDPwyNgW4k1BsX5GwtZHeusiUtAqH88W%2FWHlrpY6Y%3D&reserved=0

b) Conroy, K.M., Krishnan, S et al. (2020). Technological advancements to address elderly loneliness: Practical considerations and community resilience implications for COVID-19 pandemic. Working With Older People:

<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.emerald.com%2Finsight%2Fcontent%2Fdoi%2F10.1108%2FWWOP-07-2020-0036%2Ffull%2Fhtml&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C1%7C637424385267620819%7CUnknown%7CTWFpbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IklhaWwiLCJXVCi6Mn0%3D%7C1000&data=ow0b6NCyeF6c1uCKqnv17rpnnEyjaT2NjEGd%2Fj5ZG5M%3D&reserved=0>

Response: Thank you very much for drawing our attention to these relevant publications.

We have added a sentence to our paragraph in the discussion that focuses on possible interventions to recognize the potential value of psychological approaches in alleviating loneliness in older adults:

“Virtual consultations and social prescribing (i.e. linking patients with nonclinical supports in their community such as outdoor exercise classes, walking groups, virtual bereavement programs, etc) may be effective strategies to reduce loneliness during COVID-19 and beyond.^{44,46,47} Additionally, the Campaign to End Loneliness recently profiled psychological approaches,⁴⁸ including cognitive behavioural therapy^{49,50}, mindfulness⁵¹, and positive psychology,⁵² as promising interventions for addressing loneliness in older adults.

And to the following paragraph on digital technologies to enhance virtual social connection, we have added:

“Lastly, technology can facilitate social connection and improve access to psychological interventions in the midst of physical distancing measures.^{46,53} For older adults experiencing social loneliness as a result of being disconnected from their social network, websites or apps such as Facetime and Zoom can connect them to family and friends and provide continuity of group activities such as exercise classes, spiritual services, etc.⁵⁴ These platforms can similarly enable access to virtual CBT and other psychological supports.⁵⁴ One important consideration, however, is that, in order to be effective, older adults must want to, know how

to use, and have access to these technologies.⁵⁴ Recent research shows that many older adults lack access to internet-enabled devices⁵⁵, and are unready for comparable technologies (i.e. video telemedicine visits) due to inexperience with technology or physical disability.⁵⁶

c) It may also be useful to include possible implications with latest efforts by big technology companies as it relates to the COVID-19 pandemic (ie exposure notification express). This could help to connect and strengthen the survey findings on technology and social connectedness into the discussion section and sharpening the future research recommendations that are needed to better understand and combat loneliness during COVID-19 with digital technology. For example, the latest releases by Apple and Google have COVID-19 tracking software embedded into the Apple iOS and Android system (using Bluetooth technology to alert users about COVID-19 positive people near them). Several news outlets have released information about the exposure notification express last month and it could help tie in the discussion of the survey findings about technology apps and devices used during the pandemic. Here is VOX article in case need a news primer about it:

<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.vox.com%2Farchive%2F2020%2F9%2F1%2F21410291%2Fapple-google-exposure-notification-express-coronavirus-covid-contact-tracing&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C0%7C637424385267620819%7CUnknown%7CTWFpbGZsb3d8eyJWljoIjoiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IjEhaWwiLCJXVCi6Mn0%3D%7C1000&data=GF3fY7sfdNioFb1i48z1Vi%2B1SIKjthzfNm2lz%2FI7xB8%3D&rreserved=0>. Also, if need specific digital technology tools, Conroy et al (2020) include names and past research references of tools that can help the authors to strengthen this discussion about technology and social connectedness.

Response: The Canadian government has also created and released a COVID-Alert app that has similar functionality and purpose. Although interesting, we feel that contact tracing apps and their role in identifying connections between individuals is beyond the scope of this paper, particularly as uptake of these apps (at least in Canada) has been poor to date. Social media apps already serve this purpose and arguably have greater functionality and uptake.

3) This paper would require specialist statistical review.

Reviewer: 3

Reviewer Name

Martina Luchetti

Institution and Country

Florida State University, United States

Please state any competing interests or state 'None declared': None declared.

Comments to the Author

The authors conducted a cross-sectional survey to evaluate loneliness among Canadian older adults during the COVID-19 pandemic. The survey also evaluates factors that may intensify feeling of loneliness during this time.

Following, my recommendations:

1. The introduction could be improved integrating more research on loneliness, in general, and loneliness during the COVID-19 pandemic, in particular.

Response: Thank you. At the time the manuscript was drafted and submitted (Sep 11, 2020), the research on loneliness during COVID-19 was just emerging. Since then, more studies on the topic have been published. We have incorporated these more recent findings into the introduction, as well as the discussion, and emphasized where knowledge gaps remain.

a. For example, the statement “Older adults are particularly susceptible to loneliness because of aging-related events (e.g. retirement, declining health, widowhood)” it is only partially true. In fact, loneliness is common at every age, and it is not confined to old age. Many recent studies actually suggest that level of loneliness is higher among young adults prevalence rates are highest among young adults (30 years; Hammond, Qualter, Victor, & Barretto, 2018; Luhmann & Hawkley, 2016). Some identified a complex non-linear trajectory across ages, with elevated loneliness levels among young adults and among the oldest old (Luhmann & Hawkley, 2016). Yet, some event in older adulthood might be associated with increase of loneliness (as specified by the authors). This “conflicting” findings should be integrated in the introduction or acknowledged in the discussion. The same is true for differences across genders (see Barreto et al. 2020).

Response: Thank you for this comment and we agree with the points you have outlined. In our introduction, we have modified the sentence as follows:

“While feelings of loneliness can occur at any age, research has shown that rates of loneliness follow a nonlinear U-shaped distribution, with the highest levels reported in young (<25 years) and older (>65 years) adults.³ While predisposing factors differ by life stage, older adults are at increased risk because they are more likely to experience events such as retirement, chronic illness, widowhood, and living alone.⁴”

We hope this change more accurately communicates our intent, which was to articulate that older adults are an important risk group for loneliness but certainly not the only one. As the focus of the study was on older adults (for reasons we outline in our introduction), describing other risk populations is beyond the scope of this paper. However, we have modified the last sentence of our discussion to extend our recommendations to other at-risk groups, including young adults and provided relevant citations for readers wishing to explore in more depth:

“As we move through the second pandemic wave, it will continue to be important to consistently measure how rates of loneliness change across different age groups to assess the longer-term effects of protracted physical distancing and stay-at-home measures. Such longitudinal studies will be vital to characterizing trajectories, identifying drivers of change and determining at-risk populations who could benefit from additional support, including young adults, who have reported among the highest levels of loneliness during this pandemic.^{32,63,64}”

b. There is also a growing literature on loneliness and other mental health outcomes that is not discussed in the introduction. The authors simply state “Previous infectious disease outbreaks and pandemics have demonstrated increases in loneliness, anxiety, and depression from quarantine-induced social”. I suggest to update the literature review. Below, I list some of the work that have been conducted in the past months, in addition to the few cited by the authors in the discussion.

o Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. *Journal of Adolescent Health*, 67(5), 714-717.

o O'Connor, R. C., Wetherall, K., Cleare, S., McClelland, H., Melson, A. J., Niedźwiedz, C. L., ... & Watson, B. (2020). Mental health and wellbeing during the COVID-19 pandemic: longitudinal analyses of adults in the UK COVID-19 Mental Health & Wellbeing study. *The British Journal of Psychiatry*, 1-17.

o Tull, M. T., Edmonds, K. A., Scamaldo, K. M., Richmond, J. R., Rose, J. P., & Gratz, K. L. (2020). Psychological outcomes associated with stay-at-home orders and the perceived impact of COVID-19 on daily life. *Psychiatry Research*, 289, Article 113098.
<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdoi.org%2F10.1016%2Fj.psychres.2020.113098&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C1%7C637424385267630812%7CUnknown%7CTWFPbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ikl1haWwiLCJXVCi6Mn0%3D%7C1000&data=laufhOb5mSReV7k7T8ExENAA4pfJWfOsD0OUv0SnbYM%3D&reserved=0>

o Losada-Baltar, A., Jiménez-Gonzalo, L., Gallego-Alberto, L., Pedroso-Chaparro, M., del, S., Fernandes-Pires, J., & Márquez-González, M. (2020). “We are staying at home”: Association of self-perceptions of aging, personal and family resources, and loneliness with psychological distress during the lock-down period of COVID-19. *The Journals of Gerontology: Series B. Advance online publication*.

<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdoi.org%2F10.1093%2Fgeronb%2Fgbaa048&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C1%7C637424385267630812%7CUnknown%7CTWFpbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6Ikl1haWwWwLjCjXVCi6Mn0%3D%7C1000&data=gOwi60rURCKpq%2BSr%2F2IEUyLFRquBo1fXydENDuGG5O0%3D&reserved=0>

o Buecker, S., Horstmann, K. T., Krasko, J., Kritzer, S., Terziel, S., Kaiser, T., & Luhmann, M. (2020). Changes in daily loneliness during the first four weeks of the Covid-19 lockdown in Germany. <https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdoi.org%2F10.31234%2Fosf.io%2Fytkx9&data=04%7C01%7CRachel.Savage%40wchospital.ca%7C33526ceae6574bc32d8a08d89619e5cf%7C26033a94b4704c0bae8b58ee1d2eea24%7C0%7C1%7C637424385267630812%7CUnknown%7CTWFpbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6Ikl1haWwWwLjCjXVCi6Mn0%3D%7C1000&data=Z9KSuns8v89SHS%2BF5ASqeFP%2BxBIAq6Q3RylcE%2BqvfEE%3D&reserved=0>

Response: Our knowledge on the impact of COVID-19 on various populations and in different settings continues to grow and evolve by the day. At the time we submitted our manuscript, the studies listed above were not yet published. We knew comparatively little on how the pandemic was affecting the mental health of older adults, and so, literature from previous outbreaks and pandemics was of value to form hypotheses of potential impacts.

Now that more evidence has emerged, we agree that it is useful to update the introduction, especially as it relates to our knowledge on whether and in what ways mental health of older adults has changed. Thank you for providing links to some of these studies.

We have made the following change (incorporating many of the studies you list above):

“The novel coronavirus pandemic (COVID-19) and accompanying physical distancing and stay-at-home measures ... are expected to intensify feelings of loneliness. Previous infectious disease outbreaks and pandemics have demonstrated increases in loneliness, anxiety, and depression from quarantine-induced social isolation.^{18,19} Emerging research from the early stages of the COVID-19 pandemic support this hypothesis, with several studies demonstrating elevated rates of loneliness²⁰⁻²², psychological distress^{23,24}, and anxiety, depression and stress^{25,26} during lock-down periods.

c. Rather than stressing on age/gender, in the introduction I would suggest to stress more aspects like living alone and COVID-19 related factors: practice of physical distancing, history of COVID-19 symptoms, and use of digital technologies. These are all novel aspects that add to extant studies on loneliness during COVID-19. They merit more attention.

Response: We agree and have now highlighted these additional key aspects in the introduction.

We would argue, however, that factors contributing to sex differences in loneliness pre- and during- COVID is understudied and a novel contribution to the literature. While most studies on loneliness often report higher rates in women, few studies examine women and men separately, even though risk factors may have a greater influence in one sex vs. the other. There are important differences between women and men related to living alone, physical distancing, and technology that are important to consider and highlight.

While there are common contributors to loneliness in older adults (e.g. widowhood, declines in physical or cognitive abilities), prior research has shown some factors affect the sexes differently. Despite this, and to the best of our knowledge, no studies on loneliness in older adults during this pandemic have examined women and men separately to identify which risk factors are shared and which are unique. We argue that these data are essential to support all older adults more effectively during this crisis.

We have made the following changes to the introduction to better emphasize the novel aspect of our work:

“More data on loneliness in older adults during COVID-19 continues to emerge as the pandemic unfolds^{23,30-33}, yet important knowledge gaps remain. A key gap is whether older women and men have shared, or unique, risk factors for loneliness during the pandemic. Pre-COVID-19, it has been shown that while there are common contributors to loneliness in older adults, like widowhood or declining health, some risk factors affect the sexes differently. For example, mobility problems have been shown to be a strong predictor of loneliness in women, while a reduced social network strongly predicts loneliness in men.³⁴ There is also comparatively little data on the relationship between COVID-19-specific factors (e.g. level of concern, impact to daily life, COVID-19 infection)^{21,23,31} and behaviours (e.g. use of technology for social connection) with loneliness in general, but particularly among older adults. Timely data are needed that are relevant to older women and men to inform public health responses and healthcare delivery.”

d. Move the hypothesis/research questions (reported in the method) at the end of the introduction.

Response: We have moved “We hypothesized that loneliness would be common, particularly in women and those living alone, and that higher pandemic concern would increase loneliness” from the analysis section of our methods to the end of the introduction as suggested.

2. Methods are described appropriately. In term of analysis, I suggest to report as main analysis the pooled analysis for the all sample, and then follow up with analysis divided by sex (even if I do not see the stratified analysis as useful). Because of possible differences in loneliness between young-older adults and oldest-old (Luhmann & Hawkey, 2016), it will be interesting to evaluate an interaction between age (young-old older adults) and the covariates, particularly COVID-19 related factors (i.e. use of technology). Please consider to add this analysis in the paper.

Response: Given that our stratified analysis informed which interactions we pursued and tested in our pooled analysis, we chose to present the results in the same order (stratified first, pooled second). Because older women frequently report higher levels of loneliness than older men, our study and analysis was designed to examine what shared **and unique** risk factors there were for loneliness in women and men. It is true this can be achieved by using sex as an interaction term in a sex-pooled model, but we often have a poor understanding of what influences women and men’s health because scientific studies do not report sex-disaggregated findings. In our study, we found that many risk factors were shared but some exerted greater influence in women vs. men, and vice versa, and we believe there is value in reporting these data.

With respect to age, we did evaluate an interaction between age group and sex and found it to not be statistically significant ($P=0.100$ for interaction term of age and sex). We agree with you that examining how the effect of the various covariates on loneliness may vary by age would be interesting. At your suggestion, we examined how the association between social media use and loneliness varied by age group, stratified by sex. Table 1 shows consistently high use of social media across age groups, although use does decline with increasing age.

Table 1. Social media use by age group.

| Social Media Use | | |
|------------------|---------------|-------------|
| | Yes | No |
| Overall | 4113 (84.5%) | 751 (15.4%) |
| Age, years | | |
| <65 | 924 (90.0%) | 103 (10.0%) |
| 65-79 | 2,782 (85.0%) | 488 (14.9%) |

| | | |
|-----|-------------|----------------|
| 80+ | 396 (71.2%) | 158 (28.4%) |
|-----|-------------|----------------|

In Table 2, you can see that similar associations of a null effect were observed across the age groups; although, findings in younger women suggest that social media use may increase the odds of loneliness in this group. We added an interaction term between age group and social media use to our final model and found the term to not be statistically significant.

Table 2. Association between social media use and loneliness, stratified by sex and age group.

| | WOMEN | | MEN | |
|-----------------------------|--------------|-------------------------------|--------------|-------------------------------|
| | n (%) | Unadjusted OR (95% CI) | n (%) | Unadjusted OR (95% CI) |
| Age, <65 years | | | | |
| Social media use - no (ref) | 33 (48.5) | -- | 13 (41.9) | -- |
| Social media use - yes | 407 (53.2) | 1.19 (0.72-1.95) | 52 (37.7) | 0.82 (0.37-1.81) |
| Age, 65-79 years | | | | |
| Social media use - no (ref) | 142 (50.4) | -- | 55 (30.4) | -- |
| Social media use - yes | 965 (49.1) | 0.95 (0.74-1.21) | 193 (26.4) | 0.82 (0.57-1.17) |
| Age, 80+ years | | | | |
| Social media use - no (ref) | 38 (50.7) | -- | 23 (29.9) | -- |
| Social media use - yes | 86 (44.3) | 0.74 (0.44-1.26) | 54 (29.7) | 0.98 (0.55-1.75) |

We have added the following to our results section:

“Social media use was not associated with loneliness (aOR 1.13 [95% 0.94-1.36]) and the addition of an interaction term between social media use and age group was not significant.”

- One of the main limitations of the study is the cross-sectional design. This aspect should be mentioned in the bullet point list of strengths and limitations. It is unknown whether factors such as use of technology could affect trajectory of loneliness during the development of the current situation.

Response: Thank you, we have added this to our limitations section.

- In the discussion, I think is relevant to connect the data from May to the current situation. We are currently dealing with the “second wave” of infection from coronavirus, and we do not have idea what will be the impact of protracted social distancing, especially among possible vulnerable groups to loneliness. The authors should note this aspect in addition to the necessity for further longitudinal assessment.

Response: Thank you and we agree. We have updated the end of our discussion to again update results on longitudinal analyses and to emphasize the importance of continued measurement to assess the impact of more prolonged measures accordingly:

“Longitudinal studies provide the most robust evidence of temporal changes. Using data collected at three time points, Luchetti et al found that older adults were the only group studied that showed a slight increase in loneliness in late March 2020 after social distancing measures were implemented in the US compared to the baseline assessment in January/February, although levels remained stable in April.³² The study found that this increase was driven primarily by unavailable social connections, rather than feelings of isolation. O'Connor et al similarly observed an increase in self-reported loneliness in adults aged ≥60 years at two time points early in the pandemic but not in younger age groups,⁶³ while other studies have reported no change in loneliness over the course of the first pandemic wave.^{25,64} As we move through the second pandemic wave, it will continue to be important to consistently measure how rates of loneliness change across different age groups to assess the longer-term effects of protracted physical distancing and stay-at-home measures. Such longitudinal studies will be vital to characterizing trajectories, identifying

drivers of change and determining at-risk populations who could benefit from additional support, including young adults, who have reported among the highest levels of loneliness during this pandemic.^{32,63,64}

Minors:

P. 9, add "Outcome: Loneliness"

Response: Added.